REMARKS

A discharge gas utilized in a plasma display panel (PDP) has conventionally, in the past, included Neon (Ne) as a main component rather than Xe and Kr. Neon was utilized because it contributes to the emission of secondary electrons from a protective layer.

The present invention has found that including a discharge gas with at least one of Xe and Kr, was able to achieve an emission of a secondary electron from a protective layer having a specific electron band of a predetermined energy level without the necessity of having Ne as a main component. This has occurred even when the Xe and/or Kr is included at a relatively high percentage.

I) In the case when discharge gas includes Xe

In energy bands, the metastable state of Xe is located at energy level 4 eV below the vacuum level. In the PDP of the present invention, the protective layer has an electron band formed around the same depth (i.e. energy level 4 eV below the vacuum level), and accordingly electrons present in the electron band easily transit to the metastable state of Xe, see Page 4, Lines 21-23. When this transition takes place (see 201 a of FIG. 2 of the present application), the following two phenomena are caused in a chain reaction manner as described on Page 13, Line 22 to Page 14, Line 13.

(1) An electron now in the metastable state further transit to the ground state having energy depth of 12.1 eV below the vacuum level (202a of FIG 2); and thereby another electron present in the electron band of the protective layer receives energy of approximately 8.1 eV through the Auger effect, and jumps across energy depth of approximately 4 eV to be thereby ejected to the discharge space as a secondary electron (203a of FIG 2).

(2) Another electron in the electron band of the protective layer transits to the ground state (201b of FIG 2); and herewith, a third electron in the metastable state of Xe receives energy of approximately 8.1 eV through the Auger effect, and jumps across energy depth of approximately 4 eV to be thereby ejected to the discharge space as a secondary electron (203b of FIG 2).

II) In the case when discharge gas includes Kr

In energy bands, the metastable state of Kr is located at energy level 4 eV below the vacuum level. In the PDP of the present invention, the protective layer has an electron band formed around the same depth (i.e. energy level 4 eV below the vacuum level), and accordingly electrons present in the electron band easily transit to the metastable state of Kr. When this transition takes place, the following two phenomena are caused in a chain reaction manner.

(3) An electron now in the metastable state of Kr further transit to the ground state having energy depth of 14 eV below the vacuum level; and thereby another electron present in the electron band of the protective layer receives energy of approximately 10 eV through the Auger effect, and jumps across energy depth of approximately 4 eV to be thereby ejected to the discharge space as a secondary electron.

(4) Another electron in the electron band of the protective layer transits to the ground state; and herewith, a third electron in the metastable state of Kr receives energy of approximately 10 eV through the Auger effect, and jumps across energy depth of approximately 4 eV to be thereby ejected to the discharge space as a secondary electron.

The Office Action contended that the *Kimura* Japanese Laid-Open Patent Application 2001-32175 completely anticipated Claims 1-3 and 6 under 35 U.S.C. §102.

> "[A]nticipation by inherent disclosure is appropriate only when the reference discloses prior art that must *necessarily* include the unstated limitation. . . ."
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> *Transclean Corp. v. Bridgewood Services, Inc.,* 290 F.3d 1364, 62 USPQ2d 1865 (Fed. Cir. 2002)

Kimura discloses a technology for starting a discharge at a lower voltage by creating an oxygen deficit in the magnesium oxide of the protective layer to thereby create an energy level, within a forbidden band, that is closer to the conduction band, and also includes a description of the protective layer having an energy level, within a forbidden band, close to the conduction band.

In addition, *Kimura* describes that the emission intensity is increased by injecting oxygen ions into MgO, which changes the peak wavelength of the cathode luminescence to approximately 400 nm, from about 500nm which would have been obtained before an oxygen-ion injection, from the oxygen ion gun 34, whereby the firing voltage can be reduced by 10%.

However, unlike Claim 1 of the present application, the production method of *Kimura* cannot realize the forming in the protective layer, of an electron band including at least electrons having an energy level of 4 eV or less below a vacuum level within a forbidden band in energy bands.

As described in the Paragraph [0123] of the present specification, a conventional protective layer has a composition substantially identical to the stoichiometric ratio of MgO, and, as indicated with 401 in FIG. 6, has an emission peak at an energy level of approximately 3.5 eV (corresponding to a peak wavelength of approximately 400 nm) according to the cathode luminescence evaluation. That is, the protective layer of *Kimura* is representative of a conventional MgO film as regarded by the present application.

According to the present invention, in order to create the protective layer of our invention as described in Paragraphs [0125] and [0126], the peak emission of cathode luminescence of MgO is set at an energy level of approximately 3 eV, as indicated with 402 in FIG. 6, by: (a) first adjusting the amount of oxygen to be introduced as well as constituents of residual gas in a MgO film formation process; and (b) thereby setting the oxidation-reduction state of MgO to be in a slightly more reduced state as compared to the stoichiometric ratio.

Thus, the present invention realizes our invention by adjusting the amount of oxygen to be introduced while monitoring the emission peak wavelength of the cathode luminescence during the MgO film formation process.

The manufacturing method disclosed by *Kimura* does not perform such an adjustment of the amount of oxygen to be introduced.

The Office Action has mistakenly asserted that a protection layer of MgO that has a known chemical property will provide the same properties and disregards the imposed unique properties of the energy level of our invention and its symbiotic relationship with our discharge gas components such as Kr.

Kimura fails to recognize the result effective variable of our particular energy level as defined in our claims.

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.).
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> MPEP §2144.05 (II)(B) (underline added)

Accordingly, the protective layer of Claim 1 of the present application is created by a completely different method from that of the protective layer of *Kimura*, and provides a unique protective layer as described in Claim 1 of the present application which is not the same as the protective layer of *Kimura*.

The Office Action further rejected Claims 1-4 and 6 as being completely anticipated by *Nakahara* (U.S. Patent No. 6,248,864) under 35 U.S.C. §102.

Nakahara discloses a technology for reducing the occurrence of black noise by forming on at least a surface layer of the insulating layer (which the Office Action asserts is an equivalent to the protective layer of the present application which comes in contact with the discharge gas), a magnesium oxide film whose impedance at 100 Hz in one square centimeter is in the range of 230-330 kΩ, or a magnesium oxide film including silicon in the range of 500-10000 weight ppm. The formation of such a magnesium oxide film increases the amount of secondary electrons emitted and makes up for a decrease in the effective voltage due to residual charge to thereby reduce the charge remaining.

The Office Action also contends that *Nakahara* teaches an identical chemical composition as that of the protective layer of the present application and, therefore, features of the protective layer of the present application are inherently present in *Nakahara*. Applicant respectfully traverses this contention.

In *Nakahara*, the substrate temperature, which is an important condition pertaining to creation of an MgO film, is 150 °C. On the other hand, the substrate temperature according to the manufacturing method described in our present specification is in the range of 200 °C to 300 °C, and thus the condition is substantially different from that of *Nakahara* and provides a different property.

Furthermore, the addition rates of impurities included in the protective layer of our invention are different from those of the present invention.

Thus, when the conditions for film creation and the additional rates of impurities are different from those of the present invention, the resultant protective layer must also be different in performance and properties. The protective layer manufactured by the method described by *Nakahara,* therefore, does not have the invention features of Claim 1 of the present application, and accordingly Claim 1 of the present application is novel.

Also *Nakahara* describes the use of a discharge gas which is composed of Neon and a small amount of Xe, however, unlike the present invention, it fails to recognize the issue of using a larger ratio of Xe or Kr in the discharge gas, which will hardly make a contribution to the protective layer's performance of emitting secondary electrons. *Nakahara* does not disclose, unlike Claim 1 of the present application, forming, in the protective layer, an electron band including at least electrons having energy level of 4 eV or less below a vacuum level within a forbidden band in energy bands in order to make up for the low performance of secondary electron emission. Furthermore, no description can be found in *Nakahara* regarding energy bands.

Accordingly, contrary to the invention of Claim 1, it is unlikely that *Nakahara* is able to teach a structure for maintaining the performance of secondary electron emission by providing an electron band, within the protective layer, at a depth of 4 eV below the vacuum level, which is the substantially same depth where the metastable state of Xe/Kr is located.

The Office Action further rejected Claims 5 and 14 over a combination of the *Kimura* reference when taken in view of the *Akiyama et al.* (Japanese Laid-Open Patent Application 2003-272533).

> It is the Examiner's burden to establish *prima facie* obviousness. *See In re Rijckaert*, 9 F.3d 1531, 1532 (Fed. Cir. 1993) Obviousness requires a suggestion of all the elements in a claim *(CFMT, Inc. v. Yieldup Int'l Corp.,* 349 F.3d 1333, 1342 (Fed. Cir. 2003)) and "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). Here, we find that the Examiner has not identified all the elements of claim 1, nor provided a reason that would have prompted the skilled worker to have arranged them in the manner necessary to reach the claimed invention.
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> *Ex parte* Karoleen B. Alexander, No. 2007-2698, slip op. at 6 (B.P.A.I. Nov. 30, 2007)

Akiyama et al. was simply cited to show Group II and VI elements in a protective layer with an additive element selected from Group IV and V having a higher concentration adjacent the discharge space to reduce a discharge start voltage. There is no teaching or suggestion to a person of ordinary skill to provide the structure of the present invention.

Claims 7-10 and 12 are rejected over the *Nakahara* reference in view of *Kajiwara* (U.S. Patent No. 6,833,086) under 35 U.S.C. §103.

The Office Action relied upon an inherent characteristic of the chemical composition of MgO and its properties to contend that an electron band having electrons with an energy level of 5 eV or less low vacuum level would be formed within the forbidden band and energy bands.

As can be appreciated, Claim 7 is now characterized further by our protective layer having an electron band at least including electrons having energy level of more than 4 eV but below 5eV or less below a vacuum level within a forbidden band.

Additionally, our discharge gas includes at least Kr and it has been found that the emission of secondary electrons from the protective layer is made less likely to be reduced as a result of our invention. These advantages are achieved for the following reasons.

(1) An electron present in the electron band of the protective layer transits to the ground state of Kr having an energy depth of 14 eV (301 in FIG. 7); and herewith, another electron in the electron band of the protective layer receives energy of approximately 9 eV through the Auger effect, and jumps across an energy depth of approximately 5 eV to be thereby ejected to the discharge space as a secondary electron (302a in FIG. 7).

(2) An electron present in the electron band of the protective layer transits to the ground state of Kr-(301 in FIG. 7), as described above; and another electron in the valence band of the protective layer receives energy of approximately 9 eV through the Auger effect, and jumps across energy depth of approximately 8.8 eV to be ejected to the discharge space as a secondary electron (302b in FIG. 7).

Kajiwara teaches a phosphor powder composed of a host material made of an element within the Group II of the periodic table and an element coming from the Group VI of the periodic table, as an activator and a co-activator, and discloses a technology for setting the ratio of the activator to be a predetermined ratio and also arranging the molar concentration of the co-activator to be equal to the molar concentration of the activator to thereby improve crystallinity, which results in a phosphor power that does not decrease in luminescence efficiency for a long period of time. *Kajiwara* also describes the use of the phosphor powder in PDPs.

Thus, *Kajiwara* relates not to an invention of a new protective layer but rather to an inventive feature of a phosphor powder, and accordingly does not teach our composition of a PDP protective layer.

The Office Action states that *Kajiwara* discloses that an inclusion of Kr in the discharge gas leads to a reduction in the firing voltage. However, in a PDP, Ne which largely contributes to a reduction in the firing voltage is mainly used as a discharge gas, as described above, and contrarily Kr is an element which is less likely to contribute to a reduction in the firing voltage.

Thus, *Kajiwara* teaches a completely different feature from our invention of the amended Claim 7, and is, therefore, not an appropriate teaching to a person of ordinary skill in this field.

Nakahara describes the use of a discharge gas which is composed of neon and a small amount of Xe, but includes no description relative a discharge gas including Kr. Accordingly, *Nakahara* fails to recognize the problem that the larger the ratio of Kr, which hardly makes a contribution to the protective layer's performance of emitting secondary electrons, to the entire discharge gas is, the lower the performance of emitting secondary electrons.

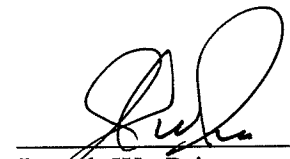
Nakahara does not disclose, unlike the amended Claim 7, including at least Kr in the discharge gas and forming, in the protective layer, an electron band including at least electrons having energy level of more than 4 eV but 5 eV or less below a vacuum level within a forbidden band inn energy bands in order to make up for the low performance of secondary electron emission. Furthermore, no description can be found in *Nakahara* regarding energy bands.

Applicant believes the claims are now in condition for allowance and respectfully requests an early notice of allowance.

If the Examiner has any questions with regards to this matter, the undersigned attorney would appreciate a telephone conference.

Very truly yours,

SNELL & WILMER L.L.P.



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